03-187 RECEIVED

SEP 19 2006

Federal Communications Commission
Office of the Secretary

Louis Peraertz

From: *Joelle Gehring [joelle.gehring@cst.cmich.edu]*
Sent: Thursday, January 05, 2006 10:59 PM
To: acraig@abcbirds.org; dniven@audubon.org; gagnon.benoit@hydro.qc.ca; becky.whittam@ec.gc.ca; Drajs.Vujnovic@gov.ab.ca; melanie.cousineau@ec.gc.ca; Aaron Goldschmidt; Michael.L.Avery@aphis.usda.gov; cooleytm@michigan.gov; mcurry1@msn.com; Craig Czarnecki; Mike DeCapita; Robert Diehl; Jack Dingledine; Rex Ennis; Burr Fisher; Bill Evans; Phil Huber; Steve Lewis; Al Manville; Chris Mensing; Frank Moore; Louis Peraertz; Ellen Paul; Ray Rustem; Chris Schumacher; Scott Sillett; Jeff Spendelow; Gerald Winegrad; dewert@tnc.org; rick.farrell@faa.gov; Fierkej@michigan.gov; dfisher@abcbirds.org; kevin.haggerty@faa.gov; herberME@michigan.gov; jhojnowski@fs.fed.us; jansonJ@michigan.gov; Donald Johnson; mknee@LRBOI.com; rsanders@LRBOI.com; lederlep@michigan.gov; bnoelmarinebio@hotmail.com; stangel@nfwf.org; nsvoboda@LRBOI.com; ted_swem@fws.gov; thompsoT@michigan.gov; gwwabc@comcast.net; ferrug@pasty.com; zerlautJ@michigan.gov; Lyn_MacLean@fws.gov; Grackler@aol.com
Cc: debbierousseau@earthlink.net; Lisa_williams@fws.gov; rdcny@earthlink.net; mmesure@sympatico.ca; shaffert@msu.edu; lnielsen@edmlink.com; Randi.McPhillips@gov.ab.ca; Glenn.Barrett@ec.gc.ca; erin_macchia@yahoo.com; Jim.Patterson@faa.gov; MIGILLETT@aol.com; Karyn_Tremper@fws.gov; Brad_Winn@dnr.state.ga.us; todd_schneider@dnr.state.ga.us; todd.katzner@aviary.org; sg-wtp@juno.com; jporter@peregrineenvironmental.com; skniffen@sagchip.org; greg_soulliere@fws.gov; grebe5k@cs.com; Alex Hoar; Art Clark; Bill Howe; Bob Beason; Bob Blohm; Brian Millsap; Catherine Rich; Charles Kemper; Chris O'Meilia; Colleen Fahey; Cyndi Perry; Dan Sealy; David Blockstein; David Mizrahi; Deb Pressman
Subject: progress report for Michigan bird collision study (email group A)

Fall 2005 progress report.doc ...

Hello all,

Attached is the most recent progress report for the Michigan study of avian collisions with communication towers. This past season we had the opportunity to compare bird mortalities at towers with different lighting systems. It is important to consider that these data are from the fall of 2005. They are generally consistent with the data we collected in the spring 2005. However, please consider that additional seasons of data collection will strengthen the analysis and lend more confidence to the conclusions.

Please feel free to contact me if you have any questions!

Very Sincerely,
Joelle

Joelle Gehring, Ph.D.
Department of Biology
Central Michigan University
Mount Pleasant, MI 48859

989-588-9573
989-774-3462 (fax)

Avian Collision Study for the Michigan Public Safety Communications System (MPSCS): Summary of Fall 2005 Field Season

30 December 2005

Joelle Gehring, Ph.D.
Central Michigan University
Department of Biology
Mount Pleasant, Michigan

and

Curry & Kerlinger, LLC

Introduction

This report summarizes the preliminary results of the fall 2005 field season, as well as additional progress towards the study's completion. Tasks and field seasons completed prior to August 2005 were documented in previous progress reports.

Progress

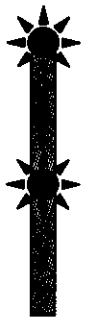
Fall 2005 field season

The study design and field work were completed according to the Avian Collision Study Plan for the Michigan Public Safety Communications System (MPSCS): Assessing the Role of Lighting, Height, and Guy Wires in Avian Mortality Associated with Wireless Communications and Broadcast Towers (revised version: April 27, 2004; Gehring 2004). In summary, 21 MPSCS towers, 116-146 m (380-480 ft) Above Ground Level (AGL), were randomly selected for inclusion in the full study. Additionally, I secured permission to include 3 privately-owned television-type towers ≥305 m (>1,000 ft) AGL in the study. One objective of this study is to assess the differences in bird mortality at towers with different lighting systems. The following night-time tower light systems were compared:

i. towers with white strobe lights but no steady burning (non-flashing) lights;
ii. towers with red strobe lights but no steady burning lights;
iii. towers with red, flashing, incandescent lights but no steady burning lights; and
iv. towers with both flashing red strobe lights and steady burning lights (status quo for MPSCS) (Fig. 1).

Nine of the MPSCS towers were self-supporting (no guy wires) and the remaining 12 MPSCS towers were supported by guy wires. The three towers ≥305 m were equipped with guy wires. As described in the research proposal, each technician was assigned to a designated tower where they simultaneously and systematically searched for bird carcasses during 20 consecutive mornings during the peak of migration for neotropical migrating birds (7 September -26 September) (Gehring 2004).

- 3 guyed towers 116-146 m (380-480 ft) AGL with white strobes at the top level and mid level; no steady burning, incandescent lights
- 3 unguyed towers 116-146 m (380-480 ft) AGL with white strobes at the top level and mid level; no steady burning, incandescent lights



- 3 guyed towers 116-146 m (380-480 ft) AGL with red strobes at the top level and mid level; no steady burning, incandescent lights
- 3 unguyed towers 116-146 m (380-480 ft) AGL with red strobes at the top level and mid level; no steady burning, incandescent lights

- 3 guyed towers 116-146 m (380-480 ft) AGL with red, flashing, incandescent lights at the top level and mid level; no steady burning, incandescent lights
- 3 unguyed towers 116-146 m (380-480 ft) AGL with red, flashing, incandescent lights at the top level and mid level; no steady burning, incandescent lights

- 3 guyed towers 116-146 m (380-480 ft) AGL with red strobes at the top level and mid level; *with* steady burning red, incandescent lights at the midpoints between the top-level and mid-level strobes and red steady burning, incandescent lights at the midpoints between the mid-level strobe and the ground (current lighting system for many communication towers including MPSCS towers)

Figure 1. Four different communication tower lighting systems were installed on the Michigan Public Safety Communication System towers. The areas under these towers were simultaneously and systematically searched for bird carcasses during 20 consecutive mornings surrounding the peak of songbird migration in the fall 2005. Additional data will be collected in the spring 2006 and possibly the fall 2006 (pending funding). These data will be used to examine the relationships between bird mortality and tower lighting systems and tower support systems.

Over 20 days technicians and I found a total of 173 birds determined to be killed during the study period (53 birds at MPSCS towers) (Table 1). During this field season the maximum number of birds found in 1 morning at 1 tower was 10.

Table 1. The number of bird carcasses found at 24 Michigan communication towers (21 MPSCS towers and 3 privately owned towers) during 20 days in the fall of 2005.

Tower support	Height category AGL	Light System	Number of towers searched	Number of carcasses found
Unguyed	116-146 m (380-480 ft)	White strobe	3	2 (mean = 0.67, SE = 0.67)
		Red strobe	3	1 (mean = 0.33, SE = 0.33)
		Red blinking incandescent	3	2 (mean = 0.67, SE = 0.33)
Guyed	116-146 m (380-480 ft)	White strobe	3	8 (mean = 2.67, SE = 2.19)
		Red strobe	3	8 (mean = 2.67, SE = 2.19)
		Red blinking incandescent	3	14 (mean = 4.67, SE = 0.33)
		Status quo (w/ non-blinking lights)	3	18 (mean = 6.00, SE = 2.65)
Guyed	≥305 m (1000 ft) (privately owned towers)	Status quo (w/ non-blinking lights)	3	120 (mean = 40.00, SE = 18.03)
Total	**All towers**		**24**	**173 (53 at MPSCS towers)**

I identified each specimen to taxonomic species when possible (Table 2). The avian species identification data will be validated by Caleb Putnam (Michigan Audubon Society), an experienced ornithologist familiar with the avifauna of Michigan. Forty-two species of birds were collected and identified to have collided with the towers during the fall 2005 study period. The Blackpoll Warbler (*Dendroica striata*) was the most common species observed this field season, with the Mourning Dove (*Zenaida macroura*) as the second most common species detected (Table 2). Although the majority of bird species that collide with communication towers are night-migrating songbirds, the Mourning Dove and several other species listed in Table 2 do not fall into this category.

Table 2. Avian mortalities (by species) at 24 Michigan communication towers (21 MPSCS towers and 3 privately owned towers) during 20 days in the fall of 2005.

Bird Species[a]	**Numbers of carcasses found (24 towers)**
Ruffed Grouse (*Bonasa umbellus*)	1 (<1%)
Wild Turkey (*Meleagris gallopavo*)	2 (1%)
Mourning Dove (*Zenaida macroura*)	13 (8%)
Northern Flicker (*Colaptes auratus*)	1 (<1%)
Blue Jay (*Cyanocitta cristata*)	1 (<1%)
Red-breasted Nuthatch (*Sitta canadensis*)	1 (<1%)
White-breasted Nuthatch (*Sitta carolinensis*)	1 (<1%)
American Robin (*Turdus migratorius*)	1 (<1%)
Swainson's Thrush (*Catharus ustulatus*)	4 (2%)
Brown Thrasher (*Toxostoma rufum*)	1 (<1%)
Yellow-throated Vireo (*Vireo flavifrons*)	1 (<1%)
Red-eyed Vireo (*Vireo olivaceus*)	12 (7%)
Philadelphia Vireo (*Vireo philadelphicus*)	1 (<1%)
Cedar Waxwing (*Bombycilla cedrorum*)	3 (2%)
Black-and-white Warbler (*Mniotilta varia*)	3 (2%)
Tennessee Warbler (*Vermivora peregrina*)	3 (2%)
Nashville Warbler (*Vermivora ruficapilla*)	10 (6%)
Yellow Warbler (*Dendroica petechia*)	1 (<1%)
Magnolia Warbler (*Dendroica magnolia*)	4 (2%)
Cape May Warbler (*Dendroica tigrina*)	4 (2%)
Black-throated Blue Warbler (*Dendroica caerulescens*)	2 (1%)
Yellow-rumped Warbler (*Dendroica coronata*)	1 (<1%)
Black-throated Green Warbler (*Dendroica virens*)	3 (2%)
Chestnut-sided Warbler (*Dendroica pensylvanica*)	3 (2%)
Bay-breasted Warbler (*Dendroica castanea*)	2 (1%)
Blackpoll Warbler (*Dendroica striata*)	20 (12%)
American Redstart (*Setophaga ruticilla*)	2 (1%)
Pine Warbler (*Dendroica pinus*)	2 (1%)
Ovenbird (*Seiurus aurocapillus*)	5 (3%)
Northern Waterthrush (*Seiurus noveboracensis*)	1 (<1%)
Mourning Warbler (*Oporornis philadelphia*)	3 (2%)
Common Yellowthroat (*Geothlypis trichas*)	4 (2%)

Wilson's Warbler (*Wilsonia pusilla*)	3 (2%)
Scarlet Tanager (*Piranga olivacea*)	1 (<1%)
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)	2 (1%)
Savannah Sparrow (*Passerculus sandwichensis*)	2 (1%)
Chipping Sparrow (*Spizella passerine*)	1 (<1%)
White-throated Sparrow (*Zonotrichia albicollis*)	2 (1%)
White-crowned Sparrow (*Zonotrichia leucophrys*)	1 (<1%)
Lincoln's Sparrow (*Melospiza lincolnii*)	1 (<1%)
Swamp Sparrow (*Melospiza georgiana*)	2 (1%)
Common Grackle (*Quiscalus quiscula*)	1 (<1%)
Unknown duck[b]	1 (<1%)
Unknown –crow size[b]	3 (2%)
Unknown Icteridae[b]	3 (2%)
Unknown -thrush size[b]	13 (8%)
Unknown –warbler/vireo size[b]	21 (12%)
Total:	**173 (53 at MPSCS towers)**

[a] all names of birds follow the *AOU Check-list of North American Birds*
[b] bird carcass heavily scavenged preventing identification of species

I conducted searcher efficiency (observer detection) trials to quantify the proportion of carcasses found by technicians and the proportion left undetected. By arriving at the site before technicians and placing a known number of bird carcasses within each technician's search area, I was able to quantify the proportion of bird carcasses found or observed by field technicians (Erickson et al. 2003). Chris Mensing, United States Fish and Wildlife Service, provided Brown-headed Cowbird (*Molothrus ater*) carcasses from the Kirtland's Warbler (*Dendroica kirtlandii*) recovery project in Michigan. Before placing the cowbird carcasses under study towers, I painted 80% of the individual cowbird carcasses to include small areas of yellow, red, or blue plumage to better simulate the coloration of many neotropical migrant songbirds. Due to a shortage of Brown-headed Cowbird carcasses additional songbird-sized bird carcasses were also included (i.e., road-killed birds and 2-day old chicks). To ensure the differentiation of observer detection bird carcasses from tower killed birds, I painted all observer detection bird carcasses with a fluorescing paint that was invisible except with the use of a black light. Any questionable carcasses or feather piles were later scanned in the lab to identify their source (i.e., tower kill or observer detection bird). The mean observer detection rate was 0.24 (SD =0.31). I used bootstrapping (5,000 iterations) to estimate the mean and standard deviation of the observer detection rate (Erickson et al. 2003, Manly 1997).

To quantify the rate of carcass scavenging and removal, technicians placed 15 unpainted songbird-sized bird carcasses near the edges of the search areas of their respective communication towers (Erickson et al. 2003). Carcasses were monitored daily for the duration of the study. Carcasses remained on the ground a mean of 6.69 days (SD = 2.98).

I used the mean observer detection rate and the carcass removal rate specific for each individual tower to calculate adjustment multipliers by which to correct the

observed number of birds. This adjustment method considered the probability that carcasses not found on 1 day could be found on the following days, depending on the rate of carcass removal (W. Erickson pers. comm.). These 2 interacting variables were used to determine an average carcass detection probability specific to each tower ranging between 1.58 and 5.07 (mean = 2.45, SD = 0.87).

With respect to comparing numbers of fatalities at the different tower and lighting types, I used the Kruskal-Wallis test. I determined that there were significant differences in the numbers of bird carcasses under different communication tower types ($P = 0.059$ using raw data, and $P = 0.057$ using data adjusted for carcass detection probability). I used 2 methods of multiple comparisons to determine which tower types were significantly different from one another (Zar 1984). Tukey's Honestly Significant Difference (HSD), considered the more rigorous of the 2 methods, determined that more birds were found under towers $\geq$305 m AGL than at towers 116-146 m AGL. Least Significant Differences (LSD) supported the results of Tukey's HSD (for both raw data and adjusted data). The statistical software SPSS was used for analysis and $\alpha = 0.10$ (SPSS 2001). Although trends in bird mortality were present within the lighting system types of the towers 116-146 m AGL, no statistical differences were detected (Fig. 2). It is important to note that these data are preliminary and replication is needed. Given the scientific and possible conservation implications of this research it is important that this study minimize the possibility of committing a Type II error (i.e., failing to reject a false null hypothesis; see "Current objectives" below). In this case, a Type II error would be: concluding that the numbers of bird collisions are not statistically different among tower light systems if the numbers of bird collisions are indeed different among tower light systems. Additional field seasons of data collection will enhance statistical analysis and replicate the above comparisons.

Bird migration intensity data were collected on each night of the field season, via NEXt generation RADar (NEXRAD) (Diehl et al. 2003, Gauthreaux and Belser 2003). These data will be analyzed within the next several months and included in analysis when possible. It is expected that the inclusion of NEXRAD bird migration intensities as a covariate will improve the future comparisons of bird mortality among tower-type categories. The use of covariates as well as at least 1 additional field season will likely decrease the variance observed in these preliminary data from both privately owned and MPSCS guyed towers (Table 1).

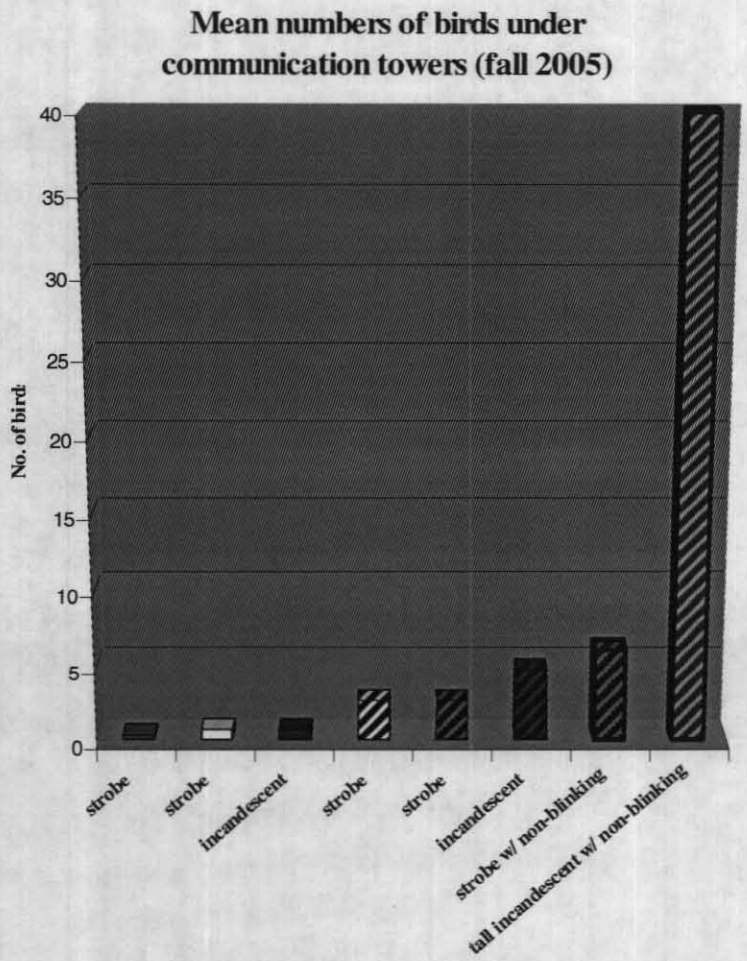


Figure 2. Bird carcass count data were compared at 8 different communication tower types during the fall of 2005 under Michigan towers. Bar colors represent the light system color. Bars delineated by striped patterns represent towers supported by guy wires; black outlines with no pattern represent unguyed towers. The bar with a gray striped pattern represents towers ≥305 m Above Ground Level (AGL), while all other towers were 116-146 m AGL. The areas under towers were simultaneously and systematically searched for bird carcasses during 20 consecutive mornings surrounding the peak of songbird migration. Additional data will be collected in the spring 2006 and possibly the fall 2006 (pending funding).

Meetings and workshops

In August 2005 I presented at the meeting of the American Ornithologists' Union (contributed paper presentation). In December 2005 I presented at the Midwest meeting of The Wildlife Society. I was invited to serve on a panel at the September 2005 annual *PCIA-The wireless Infrastructure Association* meeting, where the topic was "Avian Mortality Issues: Potential Impact on Planned and Existing Wireless Infrastructures." The Bird Conservation Alliance also requested my participation in a panel on avian hazards. This study received substantial interest and support from the ornithological and wildlife management communities as well as the stakeholders present at the meetings.

Current objectives

I will be continuing the process of NEXRAD data analysis. With the collaboration of radar ornithologist, Dr. Robb Diehl, the NEXRAD data will provide indices of migration intensity at communication towers included in the study. Given the time-consuming nature of examining and quantifying the large quantity of NEXRAD images collected during each field season, I will be working on this portion of the study whenever possible for the duration of the study.

I will continue to seek additional funding sources to further enhance this study. Currently the study is funded to continue through the spring of 2006. I will explore the benefits and costs of adding field seasons to the study, beyond the spring of 2006. Given our society's continued desire for the services these structures provide and the growing number of towers across the landscape, changes in tower lighting systems may provide a highly useful option for decreasing the attraction of night-migrating songbirds to towers; thereby, minimizing bird mortality. Many agencies, organizations, and individuals have contributed time, energy, and resources to this study in an effort to determine if tower lighting system changes can decrease the numbers of birds colliding with communication towers. This study provides a highly unique opportunity to detect potential differences in bird mortality among light systems. If bird mortality does indeed differ among tower light systems it is important that this study statistically identifies those differences (i.e., rejects false null hypothesis; via high statistical power). The power of statistical tests will increase with increased sample size. Therefore, additional field seasons are highly important to ensuring that this study has adequately and effectively compared bird mortality among towers with different lighting systems. The needs of stakeholders such as the communication tower industry, law enforcement agencies, natural resource managers, and conservationists will best be met with a well-executed and scientifically complete study of this issue.

In early 2006 I will write an annual report summarizing the findings of 2005. The annual report will include additional statistical comparisons of bird mortality at different tower types. In February I will begin recruiting and preparing for the spring 2006 field season. I am hopeful that many of the previous technicians can be retained for the spring 2006 field season. However, due to changing jobs and school schedules I will need to recruit new technicians for several of the towers.

Acknowledgments

This study could not be completed without the dedication, enthusiasm, and hard work of the technicians who conducted the early morning searches under communication towers -regardless of rainy and cold conditions. I appreciate the recruiting and advertising assistance of Michigan organizations and Internet list servers. The Michigan State Police and MPSCS is commended for granting access to towers 116-146 m AGL and for making this pioneering study possible. This study is greatly enhanced by the inclusion of towers greater than ≥305 m AGL. I owe a great amount of thanks to the private tower owners and engineers who by allowing us access to their sites, are taking important steps towards learning more about the issue of bird collisions with communication towers. The support of the Federal Aviation Administration (FAA) and Federal Communication Commission has allowed us to enhance this study via changing tower light systems. W. Erickson (WEST, Inc.) generously provided assistance and formats for calculating average detection probabilities considering both removal and observer detection rates. The interpretation and applicability of this study is greatly enhanced by his shared expertise. C. Mensing (United States Fish and Wildlife Service (USFWS)), and his technicians generously provided Brown-headed Cowbird carcasses. The use of NEXRAD is made possible by R. Diehl's (University of Southern Mississippi (USM)) interest and assistance. Many individuals regularly provide ideas, suggestions, and support for this project, including but not limited to: P. Kerlinger (Curry & Kerlinger, LLC), A. Manville (USFWS), C. Czarnecki (USFWS), S. Lewis (USFWS), G. Winegrad (American Bird Conservancy (ABC)), C. Schumacher (United States Forest Service (USFS)), E. Paul (Ornithological Council), B. Fisher (USFWS), J. Dingledine (USFWS), P. Lederle (Michigan Department of Natural Resources (MDNR)), R. Rustem (MDNR), M. Herbert (MDNR), T. Gehring (Central Michigan University (CMU)), and J. Janson (MDNR). I would like to express my gratitude to the USFWS, the MDNR and the NFWF for granting additional funds to improve this project. The views and conclusions contained in this document are those of the author and should not be interpreted as representing the opinions or policies of the U.S. Government or the National Fish and Wildlife Foundation. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government or the National Fish and Wildlife Foundation. F. Moore (USM), M. Avery (United States Department of Agriculture), G. Winegrad (ABC), R. Rustem (MDNR) and an anonymous reviewer made time to provide official reviews for the NFWF grant proposal procedure. Central Michigan University and the USFS provide greatly appreciated logistical support for this research. The majority of the funding for this research is provided by the Michigan State Police. They have also allowed access to their towers and made possible the tower light system changes. A special thanks to those individuals who were involved in changing the MPSCS tower lighting systems. They frequently worked on weekends in order to complete the job. J. Zerlaut (MPSCS), T. Thompson (MPSCS), T. Shinew (MSPCS/ Michigan State Police), M. Scieszka (MSPCS/ Michigan State Police), I. Lopez (Office of the Michigan Attorney General), P. Ryan (Perkins Coie), F. Souchet (FAA), V. Vilaro (FAA), R. Matthews (FAA), K. Haggerty (FAA), F. Souchet (FAA), and M. Curry (Curry & Kerlinger, LLC) provide important logistical support for the study.

Literature Cited

Diehl, R., R. Larkin, and J. Black. 2003. Radar observations of bird migration over the Great Lakes. Auk 120:278-290.

Erickson, W., J. Jeffery, K. Kronner, and K. Bay. 2003. Stateline Wind Project Wildlife Monitoring Annual Report, Results for the Period July 2001 - December 2002. Technical report submitted to FPL Energy, the Oregon Office of Energy, and the Stateline Technical Advisory Committee.

Gauthreaux, Jr., S. and C. Belser. 2003. Radar ornithology and biological conservation. Auk 120:266-277.

Gehring, J. 2004. Avian Collision Study Plan for the Michigan Public Safety Communications System (MPSCS): Assessing the Role of Lighting, Height, and Guy Wires in Avian Mortality Associated with Wireless Communications and Broadcast Towers. Research proposal.

Manly, B. 1997. Randomization, bootstrap and Monte Carlo methods in biology. 2nd Edition. Chapman & Hall/CRC. New York, New York.

SPSS for Windows. Rel. 11.0.1 2001. Chicago: SPSS Inc., Chicago, IL.

Zar, J. 1984. Biostatistical Analysis. Prentice Hall, Englewood Cliffs, NJ.